

CLAIMS

We claim:

1. A method for increasing neural stem cell and/or neural stem cell progeny number comprising adding pituitary adenylate cyclase-activating polypeptide (PACAP) to multipotent neural stem cells in an amount effective to increase neural stem cell and/or neural stem cell progeny number.
2. The method of Claim 1, wherein the number of neural stem cells and/or neural stem cell progeny is increased by enhancing proliferation.
3. The method of Claim 1, wherein the number of neural stem cells and/or neural stem cell progeny is increased by enhancing survival.
4. The method of Claim 1, wherein the number of neural stem cells and/or neural stem cell progeny is increased by increasing secondary neural stem cells obtained from a primary neural stem cell.
5. The method of Claim 1, wherein the neural stem cells are located in a subject.
6. The method of Claim 5, wherein PACAP is added parenterally.
7. The method of Claim 5, wherein the subject is a mammal.
8. The method of Claim 7, wherein the subject is an adult.

9. The method of Claim 7, wherein the subject is a human.
10. The method of Claim 5, wherein the subject is suffering from a neurodegenerative disease or brain injury.
11. The method of Claim 9, wherein the neurodegenerative disease is Alzheimer's Disease, Parkinson's Disease, or Huntington's Disease.
12. The method of Claim 5, wherein the subject is suffering from a stroke.
13. The method of Claim 5, wherein the increase in neural stem cell number occurs in the subventricular zone of the subject.
14. The method of Claim 5, wherein the neural stem cells and/or progenitor cells which are derived from said neural stem cells are transplanted into said subject.
15. The method of Claim 1, wherein the PACAP is PACAP38.
16. The method of Claim 1, wherein the PACAP is PACAP27.
17. The method Claim 1, further comprising adding at least one growth factor.
18. The method of Claim 17, wherein the at least one growth factor is fibroblast growth factor-2 (FGF-2).

19. The method of Claim 18, further comprising adding heparan sulfate.
20. The method of Claim 17, wherein the at least one growth factor is epidermal growth factor (EGF).
21. The method of Claim 20, wherein the EGF is EGF51N or EGF51Q.
22. The method of Claim 17, wherein the at least one growth factor is prolactin.
23. The method of Claim 17, wherein the at least one growth factor is added concurrently with PACAP.
24. The method of Claim 17, wherein the at least one growth factor is added sequentially with PACAP.
25. The method of Claim 24, wherein the at least one growth factor is added prior to the addition of PACAP.
26. The method of Claim 24, wherein the at least one growth factor is added after the addition of PACAP.
27. A method of increasing the number of neural stem cells and/or neurospheres in a culture comprising adding pituitary adenylate cyclase-activating polypeptide (PACAP) to a neural stem cell culture to increase the number of neural stem cells and/or neurospheres generated from the neural stem cell culture.

28. The method of Claim 27, wherein the neural stem cell culture is a primary culture.

29. The method of Claim 27, wherein the neural stem cell culture is a clonal density culture.

30. The method of Claim 27, further comprising adding a growth factor to the culture.

31. The method of Claim 27, wherein the PACAP is PACAP38.

32. The method of Claim 27, wherein the PACAP is PACAP27.

33. The method of Claim 30, wherein the growth factor is fibroblast growth factor-2 (FGF-2).

34. The method of Claim 33, further comprising adding heparan sulfate.

35. The method of Claim 30, wherein the growth factor is epidermal growth factor.

36. The method of Claim 35, wherein the EGF is EGF51N or EGF51Q.

37. The method of Claim 30, wherein the growth factor is prolactin.

38. A method of enhancing differentiation of neural stem cells in a

subject comprising administering pituitary adenylate cyclase-activating polypeptide (PACAP) to the subject in an amount sufficient to enhance differentiation of neural stem cells.

39. The method of Claim 38, wherein differentiation of neural stem cells into neurons is enhanced.

40. The method of Claim 38, wherein the PACAP is PACAP38.

41. The method of Claim 38, wherein the PACAP is PACAP27.

42. The method of Claim 38, wherein the subject is a mammal.

43. The method of Claim 42, wherein the subject is an adult.

44. The method of Claim 42, wherein the subject is a human.

45. The method of Claim 38, further comprising administering at least one growth factor.

46. The method of Claim 45, wherein the at least one growth factor is fibroblast growth factor-2 (FGF-2).

47. The method of Claim 46, further comprising adding heparan sulfate.

48. The method of Claim 45, wherein the at least one growth factor is epidermal growth factor (EGF).

49. The method of Claim 48, wherein the EGF is EGF51N or EGF51Q.
50. The method of Claim 45, wherein the at least one growth factor is prolactin.
51. The method Claim 45, wherein the at least one growth factor is administered to the subject prior to the administration of PACAP.
52. The method of Claim 45, wherein the at least one growth factor is administered to the subject after the administration of PACAP.
53. The method of Claim 38, wherein the subject is suffering from a neurodegenerative disease or brain injury.
54. The method of Claim 53, wherein the neurodegenerative disease is Alzheimer's Disease, Parkinson's Disease, or Huntington's Disease.
55. The method of Claim 38, wherein the subject is suffering from a stroke.
56. The method of Claim 38, wherein the differentiation of neural stem cells occurs in the subventricular zone.
57. The method of Claim 38, wherein the neural stem cells and/or progenitor cells which are derived from said neural stem cells are transplanted into said subject.